FACTA UNIVERSITATIS
Series: **Medicine and Biology** Vol. 17, No 1, 2015, pp. 33–35 UC 616.1:616.24-005

Original Article

ATRIAL FIBRILLATION DOUBLED IN-HOSPITAL MORTALITY IN 1379 ACUTE CARDIOGENIC PULMONARY EDEMA PATIENTS

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Abstract. *Medical significance of heart failure (HF) is obvious; it results from high prevalence, morbidity and mortality rate. Acute cardiogenic pulmonary edema (ACPE) is an emergency, the most severe retrograde left ventricular (LV) insufficiency. PubMed search revealed not a single paper with the objective to evaluate atrial fibrillation (AF) prevalence and prognostic significance in ACPE patients. Given the lack of information on the clinically very relevant topic, the aim of the study was to analyze prevalence, pathophysiologic consequences and possible prognostic significance of AF in ACPE. We studied homogenous group of 1397 ACPE patients, including those in cardiogenic shock, but without concomitant acute myocardial infarction (AMI). Prevalence of AF in ACPE was 29.74%. Intra-hospital mortality of ACPE patients with AF was 20.05% vs. 12.85% in patients without AF (p=0.00078). In conclusion, prevalence of AF is very high in the largest published homogenous acute cardiogenic pulmonary edema series (without AMI). Pathophysiologic mechanisms of AF-induced clinical course detrimental effects include impairment of left ventricle function (even critically), as well as induction / worsening of ischemia, etc. AF is associated with (almost) doubled mortality in acute cardiogenic pulmonary edema. AF was a better predictor of in-hospital mortality then LV ejection fraction, diabetes mellitus, and many others.*

Key words: *Acute cardiogenic pulmonary edema, heart failure, atrial fibrillation, pulse pressure, prognosis*

Introduction

Medical significance of heart failure (HF) is indisputable, resulting from high prevalence, morbidity and mortality. Prevalence of HF is believed to be 1–2% in developed countries [1]. One in five adults will have HF during lifetime, and average 1-year mortality rate is very high (23.4%) [2]. The estimation suggested 3-fold increase in HF hospitalizations from 1996 to 2050 [2]. Before 1990, the modern era of treatment, 60–70% of HF patients did not manage to survive first five years [1].

Acute cardiogenic pulmonary edema (ACPE) is an emergency, the most severe retrograde left ventricular (LV) insufficiency, associated with substantial mortality rate, both short- and long-term [3, 4]. Patients with ACPE show some differences in comparison with other acute HF patients, for example, higher hemoglobin level on admission and a more pronounced decrease during the first day of hospitalization [5].

Atrial fibrillation (AF) is the most common chronic arrhythmia, and it is associated with a 2-fold increased risk of mortality [6]. AF is also the most common arrhythmia in HF; the prevalence of AF in acute HF is >30%. AF does increase the thrombo-embolic risk (especially stroke) and it worsens HF symptoms [2]. AF can cause systolic HF ("tachycardiomyopathy") [2].

PubMed search conducted on 6/13/2015 for the terms "pulmonary edema atrial fibrillation patients" revealed 194 papers, none with the objective to evaluate AF prevalence and prognostic significance in pulmonary edema patients.

Given the lack of information on the clinically very relevant topic, the aim of the study was to analyze prevalence, pathophysiologic consequences and possible prognostic significance of AF in ACPE.

Material and Methods

We studied homogenous group of 1397 ACPE patients, including those in cardiogenic shock, but without concomitant acute myocardial infarction (AMI) [7].

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Received June 17th, 2015 / Accepted June 29th, 2015

Patients had crackles in >50% of lung field, as well as oxygen saturation <95% and were hospitalized at the Department for Cardiovascular Diseases, Clinical Center of Niš, during the period 1993–2005 [7].

The average age was 69.98±9.48 years (23-94 years) and males were slightly predominant (50.9%). Coronary artery disease and arterial hypertension were the most important etiologic factors. Protocol consisted of 25 parameters. Statistical analysis was done by commercial program SPSS, Chicago, Illinois, version 19. P-values of <0.05 were considered significant.

Results

Prevalence of AF in ACPE was 29.74%. The average age was 72.3±9.1 years in patients with AF and 69.1±9.5 years in those without AF (p<0.000001). In-hospital mortality of ACPE patients with AF was 20.05% vs 12.85% in patients without AF (p=0.00078) (Fig. 1).

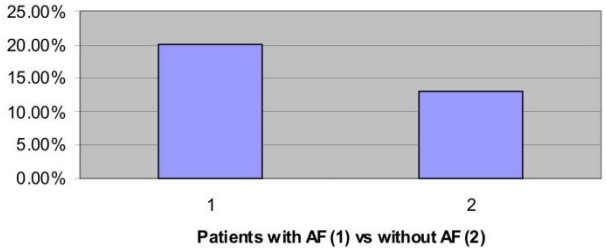

Fig. 1. In-hospital mortality of ACPE patients with vs without AF. ACPE, acute cardiogenic pulmonary edema; AF, atrial fibrillation

Pulse pressure (difference between systolic and diastolic blood pressure) was statistically significantly lower in ACPE patients with vs without AF (43.7±37.8 mmHg vs 49.0±37.3 mmHg; p=0.0334) (Fig. 2).

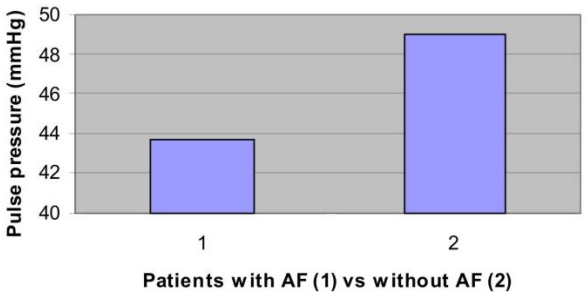

Fig. 2. Pulse pressure in ACPE patients with vs without AF. ACPE, acute cardiogenic pulmonary edema; AF, atrial fibrillation

The average heart rate on admission in ACPE patients with AF was 123.9±33.2 beats per minute (bpm), significantly higher as compared to patients without AF (107.6±26.2 bpm; p<0.000001) (Fig. 3).

Interventricular septum diastolic dimension was higher in patients with AF (12.8±2.2 mm) vs patients without AF (12.0±2.6 mm; p<0.05). No significant

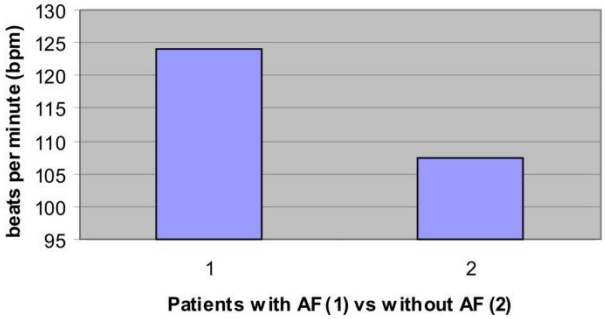

Fig. 3. Heart rate at admission in ACPE patients with vs without AF. ACPE, acute cardiogenic pulmonary edema; AF, atrial fibrillation

differences were found in: gender prevalence, prevalence of diabetes mellitus and of chronic obstructive lung disease, LV diastolic diameter, LV ejection fraction, prevalence of LV with preserved systolic function, systolic blood pressure (BP), diastolic BP, serum glucose level, white blood cell count, blood urea nitrogen and creatinine, as well as K^+ and Na^+ serum concentration.

Discussion

The prevalence of AF in ACPE was very high (29.74%), just as might be expected according to the medical literature. Acute and Chronic Heart Failure Guidelines of the European Society of Cardiology, published in 2012, cite the prevalence of AF in acute HF > 30% [1].

The average age was significantly higher (3.2 years; p<0.000001) in patients with AF compared to patients without AF. This was not surprising, as AF is predominantly the disease of aged population (AF is up to 90 times more prevalent in persons >80 years) [8]. AF was associated with almost doubled in-hospital mortality of our ACPE patients (20.05% vs 12.85%; p=0.00078; see Fig. 1). This is, to our knowledge, documented for the first time in such large homogenous series of ACPE patients without AMI.

As early as 1938, as cited by Gallagher and Camm [9], Brill observed that AF may cause HF without any other heart disease and following AF cease, recovery may be complete and long lasting. AF is a strong independent risk factor for HF [1]. Namely, AF is associated with a 3-fold increased risk of HF [6]. Vice versa, HF increases the chances for AF even 4.5 times (in men) to 5.9 times (in women) [10]. The higher the New York Heart Association (NYHA) class, the higher the AF prevalence in HF patients (from 4% in NYHA class I, to 40% in NYHA class IV) [1].

In our study, the average heart rate on admission in ACPE patients with AF was significantly higher than in patients without AF (16.3 bpm; p<0.000001) (see Fig. 3). It is an important and expected finding, because there is a clear association between uncontrolled heart rate and development of HF [1]. Moreover, there is a clear need to control high HR in acute HF, including ACPE. AF can worsen HF symptoms and worsened HF

can substantially increase heart rate in AF [1]. Patients with HF and preserved left ventricular ejection fraction (LVEF) are older and more often female and obese, less likely to have coronary artery disease and more likely to have AHT and AF than those with HF and reduced LVEF [1]. Underlying co-morbidities or subtle alterations (such as mild left atrial dilatation or low-normal LVEF), in the absence of overt heart disease, are baseline independent risk factors for incident HF during a long-term follow-up. Furthermore, incident HF is an independent predictor of adverse outcomes [11].

Conclusion

1. Prevalence of AF is very high (29.74%) in the largest published homogenous acute cardiogenic pulmonary edema series (without AMI).
2. Pathophysiologic mechanisms of AF-induced clinical course harmful effects include impairment of left ventricle function (even critically), as well as induction/ worsening of ischemia.
3. AF is associated with (almost) doubled mortality in acute cardiogenic pulmonary edema.
4. AF was the better predictor of in-hospital mortality then LVEF, diabetes mellitus, and many others.
5. Heart rate control/cardioversion are very important goals in therapy of acute cardiogenic pulmonary edema, with amiodarone and direct current cardioversion as first line therapy.

Acknowledgment. This work has been supported by the Ministry of Education and Science, Serbia; grant no. III41018.

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